DOE–EM/GJ1640-2008

Environmental Management - Grand Junction Office

MOAB UTAH UMTRA

UMTRA Project

# Flood Mitigation Plan

## Moab UMTRA Project

May 2008



U.S. Department of Energy

Office of Environmental Management

*Work Performed by the Technical Assistance Contractor Under DOE Contract No. DE-AC30-07CC60012*
*and by the Remedial Action Contractor Under DOE Contract No. DE-AT30-07CC00014*
*for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.*

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# Flood Mitigation Plan

## Moab UMTRA Project

## Revision 0

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## Revision History

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# 1.0 Introduction

The Moab Uranium Mill Tailings Remedial Action (UMTRA) Project site (Moab site) is a former uranium-ore processing facility located about three miles northwest of the city of Moab in Grand County, Utah, and lies on the west bank of the Colorado River at the confluence with the Moab Wash (Figure 1).

Section 2 provides information about river stage and flood predictions. Section 3 presents the trigger points which mandate specific actions. Section 4 provides guidance on specific steps in flood preparation.

## 1.1 Purpose

Above-normal snowfall in the Rocky Mountains during the 2007 to 2008 winter has increased the likelihood of abnormally high runoff and therefore flow rate in the Colorado River. Because the Moab site is bounded on the east by about 3,500 feet of riverbank and the site is transected by the Moab Wash, protection of the site from flood damage is essential.

This plan is intended to minimize adverse impacts on U.S. Department of Energy (DOE)-owned or managed property associated with the Moab Project from river flooding.

## 1.2 Scope

This plan is applicable to flooding that may occur at or near the Moab site and potentially at the Green River water intake for the pipeline under construction to the Crescent Junction, Utah, disposal facility.

This plan outlines the planning and actions to be taken by the Technical Assistance Contractor (TAC) and Remedial Action Contractor (RAC) in preparation of possible flood conditions. In the event of flooding, the Emergency Response Plan (DOE-EM/GJ1520) will be utilized. The Emergency Response Plan contains a Flood Action Plan checklist that includes the actions to be taken when the RAC Operations Manager calls a Flood Alert.

Activities in this plan will be performed in accordance with the established integrated work planning process.



## 1.3 Background

Historical data collected from the nearest upriver gauging station, called the Cisco Gage, reveals that during the 1983 and 1984 runoffs, the river flow rate increased from approximately 20,000 to 30,000 cubic feet per second (cfs) in only two to three days (Figure 2). In another two to three days, the flow rates exceeded 40,000 cfs. Figure 2 shows a high-altitude photo of the Moab site showing the area inundated during the 1984 flood. These runoffs were the most recent events that flooded low-lying areas of the Moab site, including where the interim action ground water remediation system well field is located. During these years, abnormally high snowfall occurred in the month of May.

Figure 3 shows the 100-year floodplain boundary for the Moab site (note that the figure is based on outdated site features).

The ground surface elevation in the vicinity of the well field at the site is 3,962 feet above mean sea level (msl). A flow rate of approximately 40,000 cfs, as measured at the Cisco, Utah, gage (U.S.G.S. Station No. 09180500), would be necessary to flood this area. A berm along the riverbank is between two and six feet higher than the ground surface (approximately 3,966 feet msl). Two additional berms also protect the toe of the mill tailings pile. These berms are both at an elevation of about 3,968 feet msl. Flow rates exceeding 60,000 cfs at the Cisco Gage are expected to cause a breech of the berms. Due to the wide girth of the river at Moab, even if inundated there is insufficient energy in the river to adversely impact the tailings pile. Therefore, protection of the tailings pile from flooding is limited to maintaining the berms during lower river stages.

Additional information is available in:

- Flood Insurance Study, Grand County, Utah. Federal Emergency Management Agency, 2006.
- Initial-Phase Investigation of Multi-Dimensional Streamflow Simulations in the Colorado River, Moab Valley, Grand County, Utah, 2004. U.S. Geological Survey Scientific Investigations Report 2005-5022.

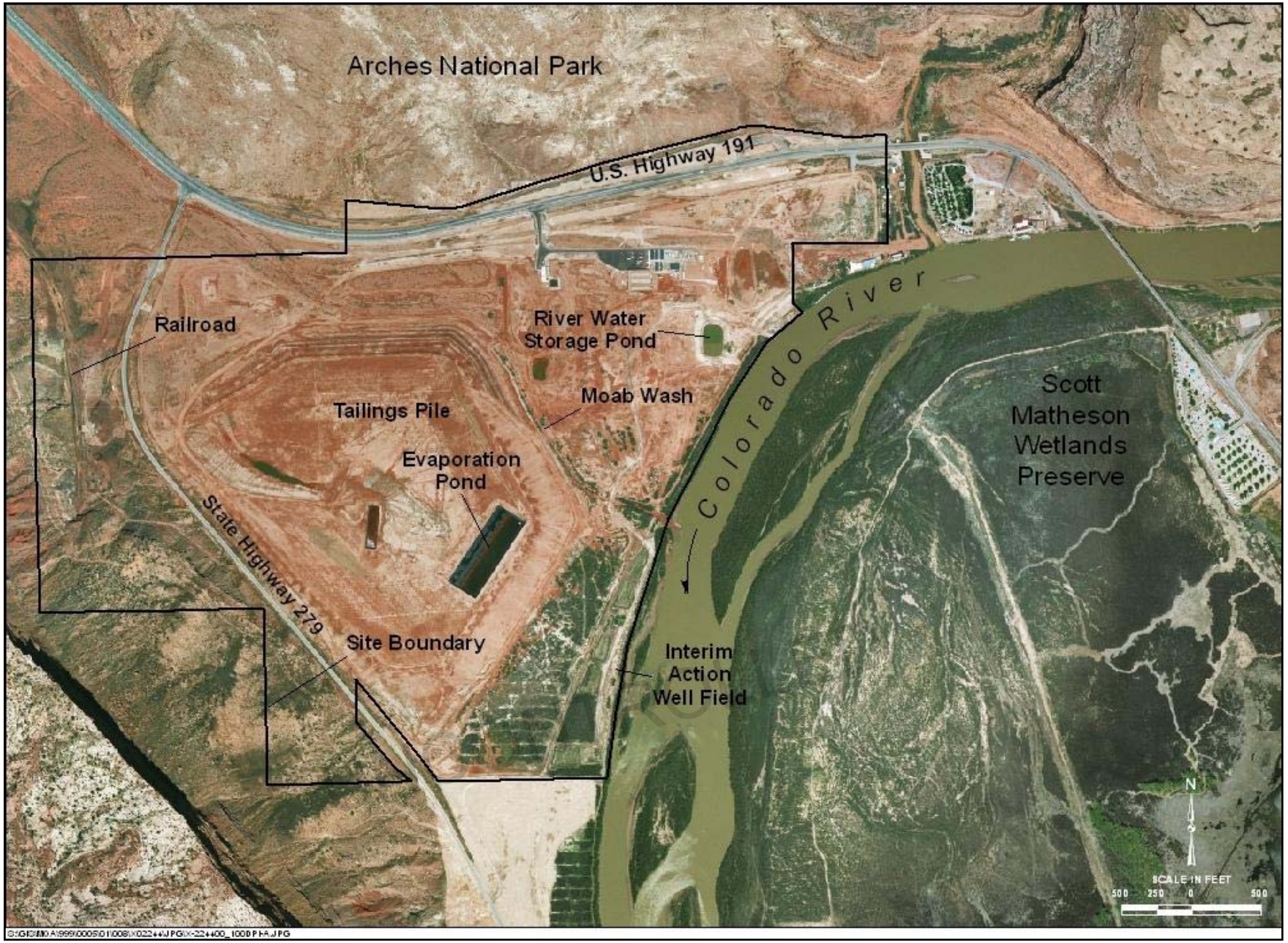


*Figure 1. Moab Site Location*

*Figure 2. Area Inundated by May 1984 Flood*
*(courtesy U.S.G.S. Global Visualization Viewer Earth Resources Observation and Science Center)*

# 2.0 Monitoring Colorado River Stage

When river flow rate at the Cisco Gage is expected to exceed 10,000 cfs the TAC monitors the current and forecast river stage daily and reports the status to the RAC at the daily safety briefing.

## 2.1 Flood Designations

The National Weather Service (NWS) has a flood warning notification system that includes several flood designations applicable to the Moab site, including flash flood warning, flood warning, and river flood warning (http://www.nws.noaa.gov/floodsafety/index). The NWS reports forecast the river stage for two weeks.
Each designation is described as follows:

- **Flash Flood Warning**
  Issued to inform the public, emergency management, and other cooperating agencies that flash flooding is in progress, imminent, or highly likely.

- **Flood Warning**
  In hydrologic terms, a release by NWS to inform the public of flooding along larger streams in which there is a serious threat to life or property. A flood warning will usually contain river stage (level) forecasts.

- **River Flood Warning**
  This warning is issued by the local NWS when forecast points (those that have formal gauging sites and established flood stages) at specific communities or areas along rivers where flooding has been forecast is imminent or is in progress. Flooding is defined as the inundation of normally dry areas as a result of increased water levels in an established water course. The flood warning normally specifies crest information. It usually occurs six hours or later after the causative event and it is usually associated with widespread heavy rain and/or snowmelt or ice jams.

  The warning will contain the forecast point covered, the current stage (if it is available), and the established flood stage. From the forecast crest, the NWS determines which areas will be affected by the river flooding. This information is included in the warning that is issued as a site/event-specific call-to-action.

  The TAC will monitor the NWS website and report any warnings to the RAC at the daily safety briefing or will contact the site Operations Manager if an immediate threat occurs.

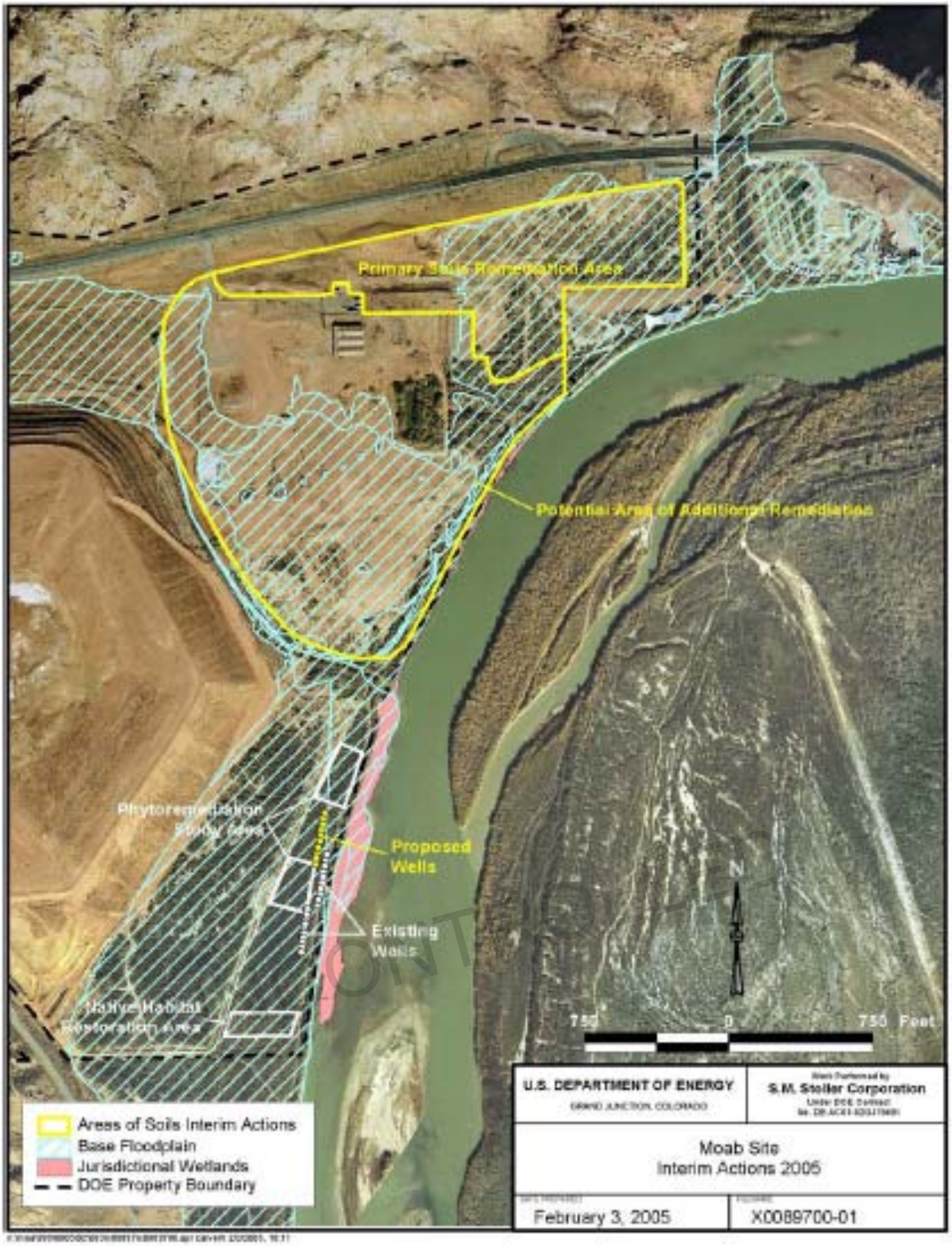


*Figure 3. Moab Site 100-Year Floodplain*

## 2.2 River Stage Reporting

Estimated Colorado River flow rates for the Cisco, Utah, gaging station (based on upstream flow rates and weather systems impacting the Colorado River basin) can be monitored via the National Oceanic and Atmospheric Administration (NOAA) website at http://www.cbrfc.noaa.gov/river/station/flowplot/flowplot.cgi?CLRU1. Figure 4 shows an example hydrograph from the Cicso Gage for the month of April 2008.

In addition, the NOAA Western Water Supply Forecast web page, http://www.cbrfc.noaa.gov/westernwater/map.php?map=wsup, provides a long-term seasonal runoff volume forecast that can be closely monitored.

Figure 5 shows an example 2008 river volume forecast for the Cisco Gage.

# 3.0 Decision-Making for Mitigating Potential Flood Damage

To avoid efforts and associated costs with flood preparation that is not necessary, specific actions are triggered by observed river flow rates and stage forecasts for the Cisco Gage. Taking the historical data into account, this plan establishes trigger points for action at 15,000 cfs, 25,000 cfs, and 30,000 cfs. These trigger points account for increases in flow rate that may occur over the weekend when site support is reduced.

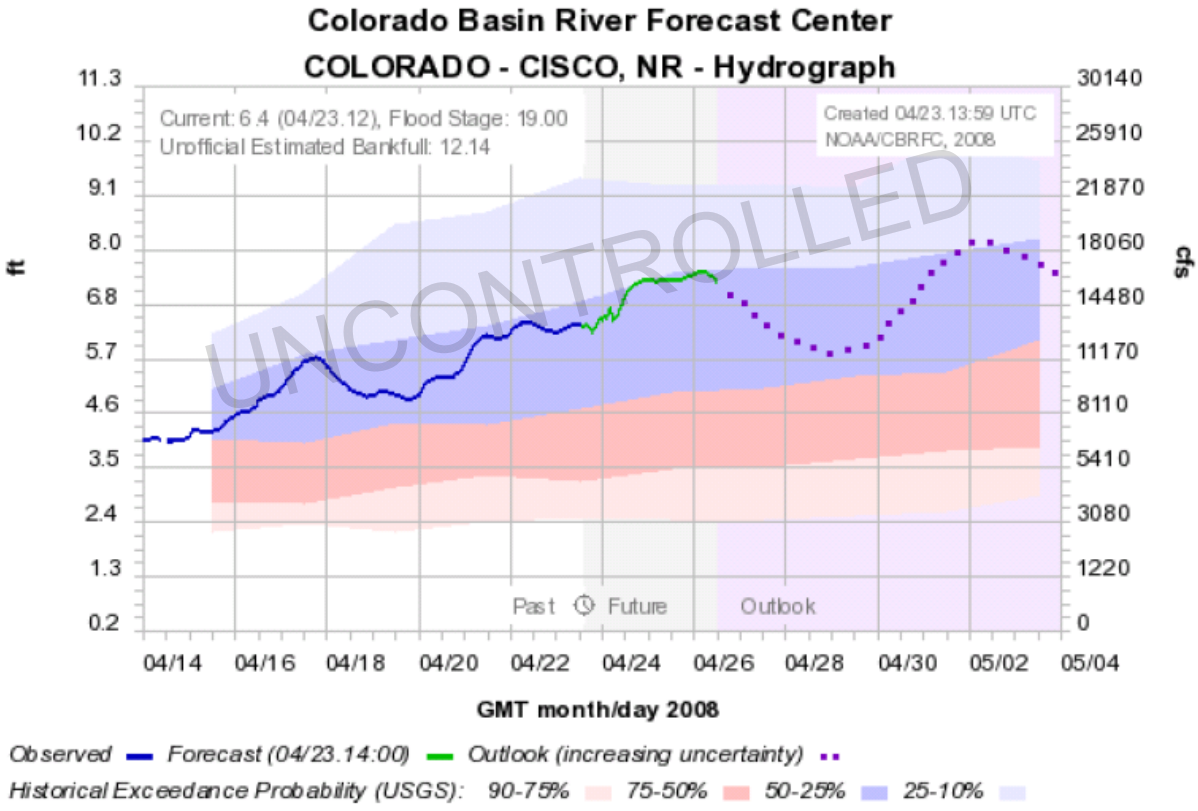


*Figure 4. Example Hydrograph From Cisco, Utah, Gaging Station*

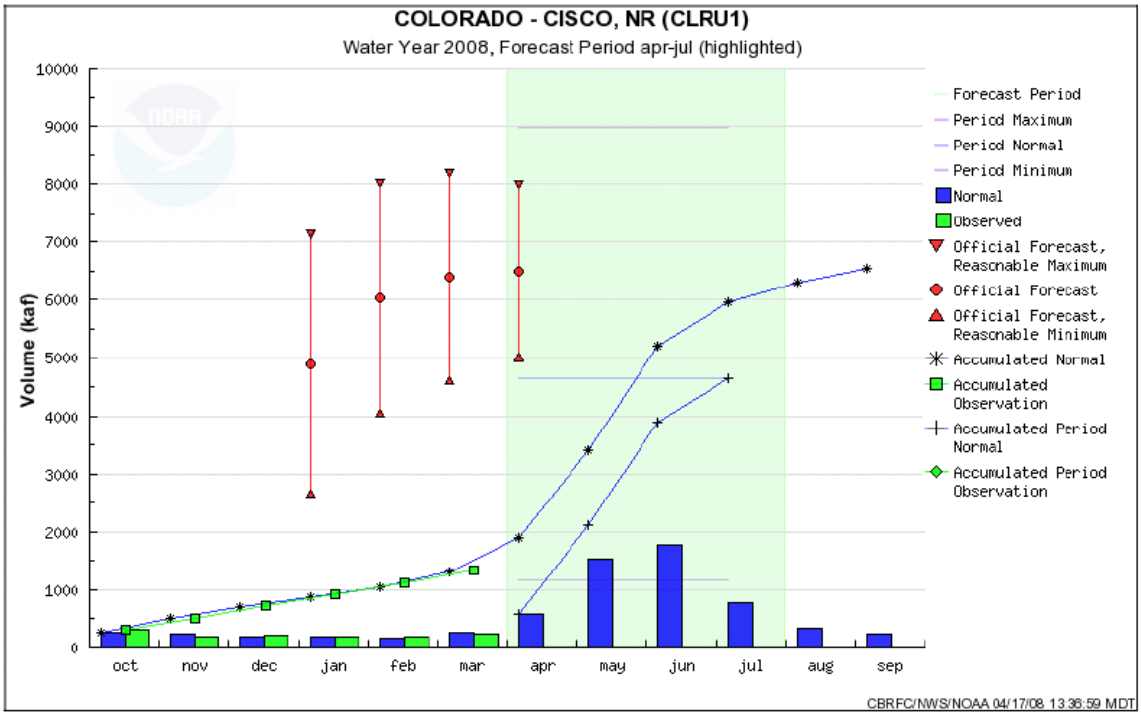


*Figure 5. Example Volume Forecast for Cisco, Utah, Gaging Station*

### 3.1 Specific Actions at 15,000 cfs and Two-Week Forecast of 40,000 cfs

If the forecast indicates maximum flow rates will exceed 40,000 cfs within the next two weeks, the **TAC** will take the following actions associated with the well field once the flow rate at the Cisco Gage reaches approximately 15,000 cfs:

- Coordinate with RAC and TAC to conduct a walk down of areas to identify potentially vulnerable assets and establish corrective actions.
- Shut down all freshwater injection into the well field.
- Continue pumping into the evaporation pond as much as possible to provide sufficient water for sprinkler system operation.
- Augment the riverbank berm with additional fill material in low-elevation areas. Install a temporary berm across the access to the Moab Wash (in the vicinity of well 0406) to prevent water contained in the Moab Wash from reaching the well field. Also, add fill material across the southern end of the well field road (to the south of well 0492) to prevent water from backing into the well field from the south.
- Verify all riverbed well point and observation well caps have been installed.
- Secure sand filter shed and prepare sand bags for placing around the shed. Remove any equipment stored in the well field equipment storage shed.
- Notify electrical subcontractor of the possibility that the power will have to be disconnected from the well field trailer. Notify subcontractor managing the port-a-john to have it removed from the well field.

- Notify the RAC concerning the possibility of having to relocate the well field trailer and equipment storage shed out of the well field.

The **RAC** will take the following actions in other areas of the site at the 15,000 cfs level should the forecast predict flows greater than 40,000 cfs:

- Stockpile several loads of stone and add material to berms to improve their integrity.
- Monitor evaporation pond level during any well field shutdown to determine if the level is acceptable to continue spraying operations. The sprinkler system should be shut down once the pond level drops below four feet to avoid damaging the system.
- Remove all equipment stored in low-lying areas and transport to areas of the site that will not be impacted by higher flow rates.
- Warn site security to notify the on-call manager of any flooding during off hours.
- Inform site security and site personnel during daily safety briefing of flood-prone areas at the site where operations will be restricted for that day.

### 3.2 Specific Actions at 25,000 cfs and Two-Week Forecast of 40,000 cfs

Once the flow rate exceeds 25,000 cfs at the Cisco Gage and is forecast to exceed 40,000 cfs within the next two weeks, the **TAC** will perform the following tasks:

- Coordinate with RAC and TAC to conduct a walk down of areas to identify potentially vulnerable assets and establish corrective actions.
- Shut down all power to the well field and secure power following loc out/tag out (LO/TO) procedures to prevent inadvertent energization to the well field.
- Measure water levels at each location equipped with a data logger/pressure transducer. Label, download, and remove each data logger/pressure transducer. Remove the Campbell Scientific CR1000 data loggers, multiplexers, radios, power converters, and solar panels from the vaults containing the telemetry equipment in Configurations 1, 3, and 4.
- Record all individual extraction/injection well flow meter values. Label and remove each well head flow meter. Remove Configurations 1, 3, and 4 Badger meter displays. Remove the Grunfos CU300 control boxes associated with each submersible pump.
- Place sand bags around the sand filter shed. Remove all equipment off the floor of the shed.
- Remove all initial action system piping located along the base of the river bank berm from the well field.
- Place sandbags around the Configurations 1, 3, and 4 transformers.
- Shut down the well field access road across Moab Wash. All access will be through the alternative route off State Route 279.

Other site-wide actions to be taken by the **RAC** at this time include:

- Relocate the well field storage shed to an area of the site that will not be impacted by higher flow rates and add sand bags to the edges of the lower Moab Wash crossing apron to contain the flow in the Wash.
- Shut down power to the river pump station and freshwater pond pumps following LO/TO procedures.
- Turn off the breakers for the pumps operating on the tailings pile that are located in the floodplain following LO/TO procedures.

### 3.3 Specific Actions at 30,000 cfs and Two-Week Forecast of 45,000 cfs

This section addresses actions to be taken if the flow rate reaches 30,000 cfs at the Cisco Gage and is forecast to exceed 45,000 cfs.

Because of the complexity of removing this trailer from the well field, special circumstances are to be applied to this task. Specific actions at this point will be as follows:

- Disconnect power from the trailer and perform LO/TO on electrical source.
- Move the trailer to a temporary staging area near the southwest corner of the parking lot.

### 3.4 Specific Actions at the Green River Intake

The TAC will monitor the Green River flow rates at the Green River Gage (USGS Station No. 09315000) and provide river stage information to the RAC Operations Manager to restrict access to the intake construction area.

## 4.0 Specific Actions for Flood Mitigation



### 4.1 Survey Site Features

Representatives of the RAC and TAC will jointly observe the Colorado River bank and lower portion of Moab Wash and associated berms to identify low points, erosional features or loose soils that may be subject to further erosion during flooding. Objects that may be disrupted during flooding will be noted to determine if relocation or protection in place is preferred. Pay attention to possible hazardous materials (see list with security guards at the site entry kiosk.) that may require special actions. The walk over survey may result in corrective actions.

### 4.2 Acquisition and Stockpiling of Materials and Supplies

At least two areas of the site will be designated for staging of materials necessary for flood mitigation; one on each side of Moab Wash. The primary materials stockpiled are sand bags and clean fill material for the bags.

### 4.3 Construction of Barriers

Identified low areas of berms that are designated for soils placement will be filled with clean soil and/or sand bags. Sand bags will be constructed and placed according to the techniques shown in Attachment A.

# Attachment A
# Sandbag Dike Construction Techniques

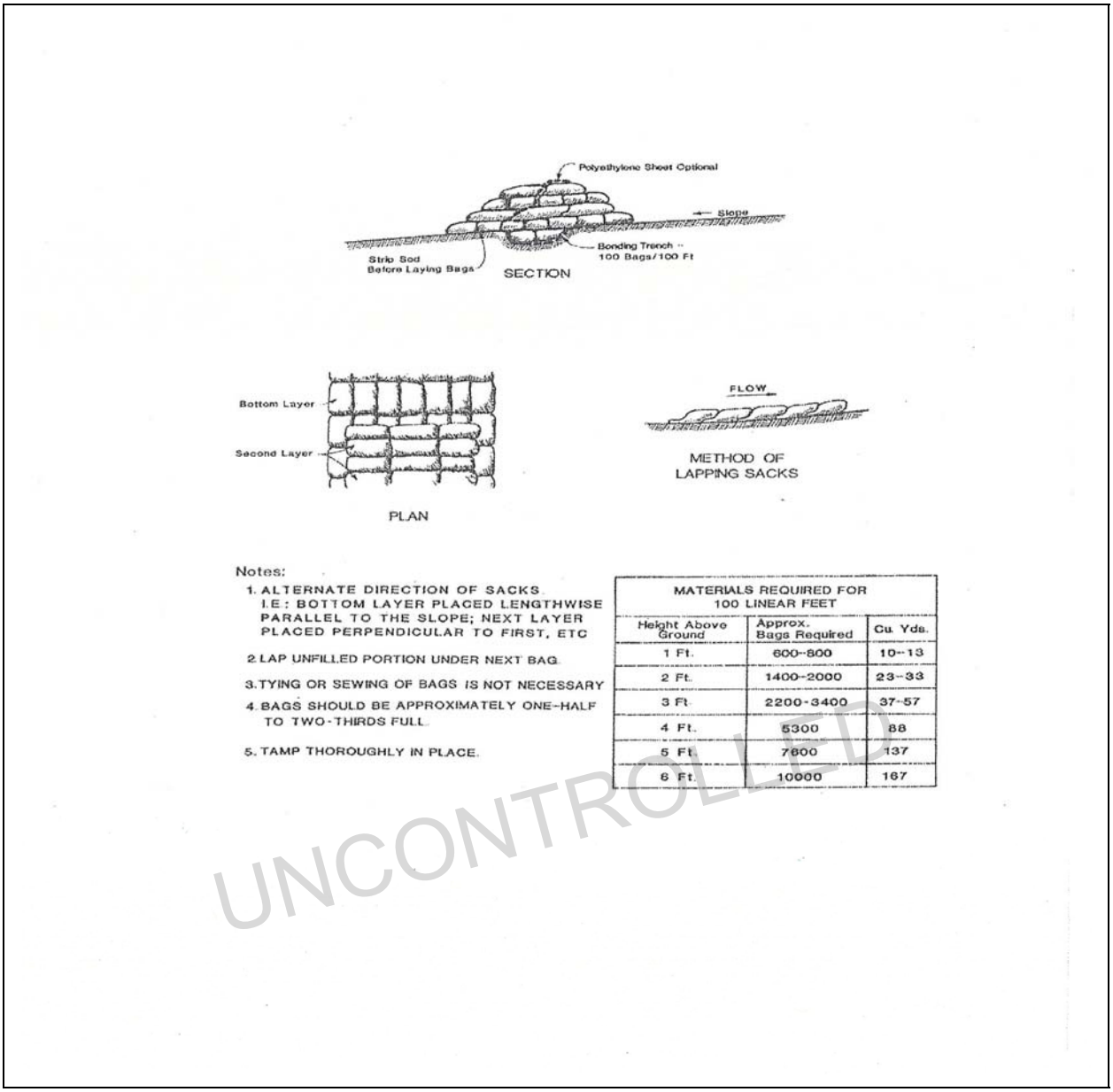




*Illustration from* Floodproofing Non-Residential Structures,
*Federal Emergency Management Agency, May 1986.*

# Appendix A

## Acronyms

| | |
|---|---|
| cfs | cubic feet per second |
| DOE | U.S. Department of Energy |
| LO/TO | lock out/tag out |
| msl | mean sea level |
| NOAA | National Oceanic and Atmospheric Administration |
| NWS | National Weather Service |
| NWSFO | National Weather Service Forecast Office |
| RAC | Remedial Action Contractor |
| TAC | Technical Assistance Contractor |
| UMTRA | Uranium Mill Tailings Remedial Action |